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SPECIFICATIONS FOR CONSTRUCTING THE RICE TEST-TUBE MILLER

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SPECIFICATIONS FOR CONSTRUCTING THE RICE TEST-TUBE MILLER 1/

J. E. Scott, B. D. Webb, and H. M. Beachell 2/

The operation of the rice test-tube miller was described by the authors. 3/ Specifications for constructing and a schematic drawing (fig. 1) of this device are presented. The various parts of the device are numbered in the drawing to correspond to the number of each item in the discussion.

SPECIFICATIONS

Table and base (1)

A piece of 5/16-inch steel plate 30 by 60 inches was used as a base for the machine. This plate was bolted to a wooden table built with 4 by 4-inch legs and framing with 2-inch center match top. The table was bolted together with 1/2-inch bolts.

The 4 by 4-inch wooden legs of the table were framed with 4 by 4-inch angle iron, 1/4-inch thick to strengthen further the table. A piece of 5/16-inch plate 6-1/2 by 6-1/2 inches was welded to the bottom of each 4 by 4-inch angle iron leg framing so that the table could be bolted to the cement floor. Cross bracing of the table with angle iron is suggested.

Adjustable shaft supports (2)

Adjustable shaft supports (Boston Gear Works No. SAP 124 4/ or equivalent) were used for mounting the rails (3). Steel bushings of

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3/ Scott, J. E., H. M. Beachell, and B. D. Webb. Rice test-tube miller. Crop Science 4(2):231-232. 1964.

4/ Trade name is used in this publication solely for the purpose of providing specific information. Mention of a trade name does not constitute a guarantee or warranty of the product by the U.S. Department of Agriculture or an endorsement by the Department over other products not mentioned.

3/4-inch bore, 1-1/4-inch O.D., and 2-1/2 inches long were used in place of the bronze-core bushings obtained with the shaft support. The bronze-core bushings were used as bearings for block-holder box (see item 7). The steel bushings were tapped and allen-head setscrews used to secure the 3/4-inch rod rails (3) to the shaft supports. The rod rails were countersunk slightly where setscrews of steel bushings were set to prevent slipping of rails. Eight shaft supports are needed.

Rails (3)

Rails were made from 3/4-inch cold roll 25 inches long. Four rails are required.

SPECIFICATIONS - Test-Tube Miller

Block-holder box (4)

The test-tube block-holder box was made from 1/16-inch black iron plate. The inside dimensions are 9 inches long, 6 inches wide, and 8-1/2 inches deep. This allows test-tube block (8) and backup block (9) of overall dimensions of 8-13/16 by 5-7/8 by 8-1/4 inches to fit conveniently into block-holder box. An opening 3 inches wide in top of box allows backup blocks (9) to be easily fitted into box.

Angle-iron frame around block-holder box (5)

Angle iron (2 by 2 by 3/16 inches) was used to frame block-holder box. The two side pieces were 8 inches long and the end piece 10 inches long. The angle-iron framing was spot-welded to the block-holder box. The flat side of the framing around box was placed 4 inches from top. The framework adds rigidity to the box to withstand stress under operating conditions, as well as for mounting pitman to box and box to the rails.

Bearing housings and bearings on block-holder box (6 and 7)

A section of 1-1/4-inch (I.D.) pipe 8 inches long was welded to each side of angle-iron frame to serve as bearing housings. Extra caution should be taken to make certain bearing housings are in exact alinement so that friction is held to a minimum. Two 3/4-inch (I.D.) steel bushings with brass core (7) were fitted in each pipe and secured with allen setscrews (two for each bushing and countersink bushing where setscrew fits). A total of eight 3/4-inch bushings (about 2-1/2 inches long and 1-1/4-inch diameter (O.D.) with 3/4-inch (I.D.) brass core) are needed. Bushings were obtained with the shaft supports.

Test-tube blocks (8)

Two sizes of test-tube blocks were made to accommodate two different sized test tubes (18 by 150 mm., and 25 by 200 mm.). The test-tube blocks were formed by gluing (laminate) together dressed 1-inch lumber. One-inch dressed lumber is about 3/4-inch thick. Pieces of 1 by 10-inch dressed pine about 9-1/2 inches long were used. Either Elmer's Glue or Weldwood contact cement or equivalent was satisfactory for laminating, but a press should be used to laminate effectively the wood (C-clamps can be used if press not available). It is important that considerable pressure be applied, particularly if Elmer's Glue is used. The grain of the various pieces of wood should be crossed when laminated to add strength to the blocks.

To form blocks for the 18 by 150 mm. test tubes, 8 pieces of 1-inch dressed lumber were glued together and for the 25 by 200 mm. test tubes, 10 pieces of 1-inch dressed lumber and 1 piece of 1/4-inch thick panel board were used. After laminating, all blocks were trimmed to 5-7/8 inches wide and 8-1/4 inches deep. The small test-tube blocks were 6-1/4 inches long and the large test-tube blocks were 8 inches long.

Test-tube blocks to be used with the 18 by 150 mm. test tubes were drilled with a 3/4-inch diameter power bit held in a drill press, if available, and holes spaced on 1-inch centers (40 holes per block). The blocks for the larger 25 by 200 mm. test tubes were drilled with a 1-inch diameter bit, locating holes on 1-5/16-inch centers (24 holes per block). The test tubes should recess about 1/4-inch in blocks, and when stoppered the stoppers should extend about 1/4-inch through the block. Synthetic rubber (neoprene) stoppers rather than natural rubber should be used.

Backup blocks (9)

The backup blocks for the 18 by 150 mm. test tubes were formed from three pieces of 1-inch lumber (approximately 2-5/16 inches thick). The backup blocks for the longer 25 by 200 mm. test tubes were formed from a 1-inch piece of lumber. A sheet of 1/16-inch thick sheet rubber was glued to one side of the backup blocks. The rubber-covered side of the backup block fits against the test-tube block, thus forming a cushion against the bottom end of the test tubes. The total length of test-tube block and backup block should be approximately 8-3/16 inches. If additional length is required, it can be obtained by gluing additional thicknesses of 1/16-inch sheet rubber to backup blocks.

A cutout in the top of block holder (3 inches wide) at closed end allows backup blocks to be readily put in place or removed. A drawer handle is secured to the top of each backup block for ease of handling.

Lid and lid clamp bar (10 and 11)

A lid with a 1/2-inch lip fits over open end of block-holder box. Lids are made from 1/16-inch iron plate 9-3/4 by 7-1/4 inches. The lid

was secured by a clamp bar formed by box welding two pieces of 3/4-inch angle iron 10-1/4 inches long. Two 3/8-inch studs welded to the angle-iron framing around block-holder box hold the clamp bar in place. Wing nuts allow ease of fastening and removing clamp bar. A 1/4-inch wide piece of 1/4-inch thick retreat sheet rubber is glued to the sides of the outer edge of the lid just inside the lip. This allows the rubber to make contact with test-tube blocks while the stoppers of the test tubes extend 1/4-inch beyond to the face of the lid. When lid is fastened with clamp bar, slight pressure should be placed on the test-tube stoppers. Test-tube blocks should be held tight during operation.

Pitman (12)

The pitmans are made from 3/4-inch cold roll rod 14-1/2 inches long. Pitmans are threaded at both ends to fasten bearing housings (use standard thread). The overall pitman length, including bearings (from center of bearing to center of bearing) is 17-1/2 inches. The length does not have to be exact. A difference in length of pitman can be allowed, as this difference will be taken up in placement of rails. The pitman is connected to the block box by welding 2 pieces of 2 by 2 by 3/16-inch angle iron 2 inches long to the underside of angle-iron frame of block-holder box. A 3/4-inch hole is drilled through the two pieces of angle iron and a 3/4-inch pin holds pitman bearing in place.

The power-wheel end of the pitman is held in place by a 3/4-inch bolt that threads into the 1/2-inch thick power wheel (14). The bearing is attached 2-3/4 inches from center of power wheel, resulting in a stroke of 5-1/2 inches. A lock nut and lock washer secures the pin. A flat washer was used as a spacer between power wheel and pitman bearing.

Pitman bearings (13)

Spherco TR-12 (aircraft type) rod-end bearings, female type (with zerk fittings), and 3/4-inch bore were used as pitman bearings. The pitman bearing that attaches to the power wheel (14) may have to be replaced with a needle-type sealed bearing similar to a Torrington CR 28 bearing or the equivalent. The CR 28 bearing has a 3/4-inch threaded stud that forms a part of the bearing assembly and can be threaded into the power wheel. A bearing housing with a female-threaded shaft welded to the housing would have to be made to connect the needle-type bearing to the pitman. However, by careful alinement of the rails on the adjustable shaft supports and proper lubrication, the Spherco bearings have given reasonably satisfactory service.

Power Wheel (14)

Morse Chain Co. TLB 636 sprocket or equivalent (9-inch diameter with 1-1/4 inch bushing) were used for the power wheel. The bushings are 2.304 by 1-1/4 inches (O.D. and I.D., respectively). Two sprockets and two bearings are needed. The sprockets make satisfactory power wheel and are readily available. The power wheels should be keyed to the 1-1/4-inch power shaft. The location of the two pitman connections

to power wheels should be directly opposite one another so that there is an alternate stroke to the two block-box assemblies. This reduces the vibration. A counterweight to reduce vibration (a half circle piece of 3/4-inch thick plate) was bolted to the inside of each power wheel and centered just opposite the pitman connection. Power wheels of a larger diameter might be helpful in further reducing vibration.

Pillow-block and base (15 and 16)

Two 1-1/4 inch pillow-blocks (Fafner LAK 1-1/4-inch or equivalent) that holds the power shaft are mounted on two bases 16 inches long, 3 inches wide, and 4 inches high. The bases were made from 5/16-inch thick angle iron, forming a box 3 inches wide (O.D.), 4 inches high, and 16 inches long. Bolts (1/2-inch) that hold pillow blocks and bases in place should extend through base plate and 2-inch wood top of table. When secured, the bases can be welded to base plate.

Flywheel (17)

The drive pully and flywheel was a 3-belt, 15-3/4-inch diameter pully (5/8-inch V-belt type) with a 1-1/4-inch bore. The heavy pulley was used to reduce vibration. One belt is satisfactory. Two pieces of 3/4-inch steel plate of the same diameter as the pulley fitted to the sides of the flywheel would further reduce vibration.

Power shaft (18)

A 16-inch long, 1-1/4-inch diameter cold roll shaft was used. The flywheel and powerwheels must be keyed to the power shaft so keyways are cut in shaft at appropriate locations. The use of a larger diameter power shaft might be desirable.

A 1-1/2 to 2-horsepower 1,750 r.p.m. 220-volt motor operates machine (19-not shown)

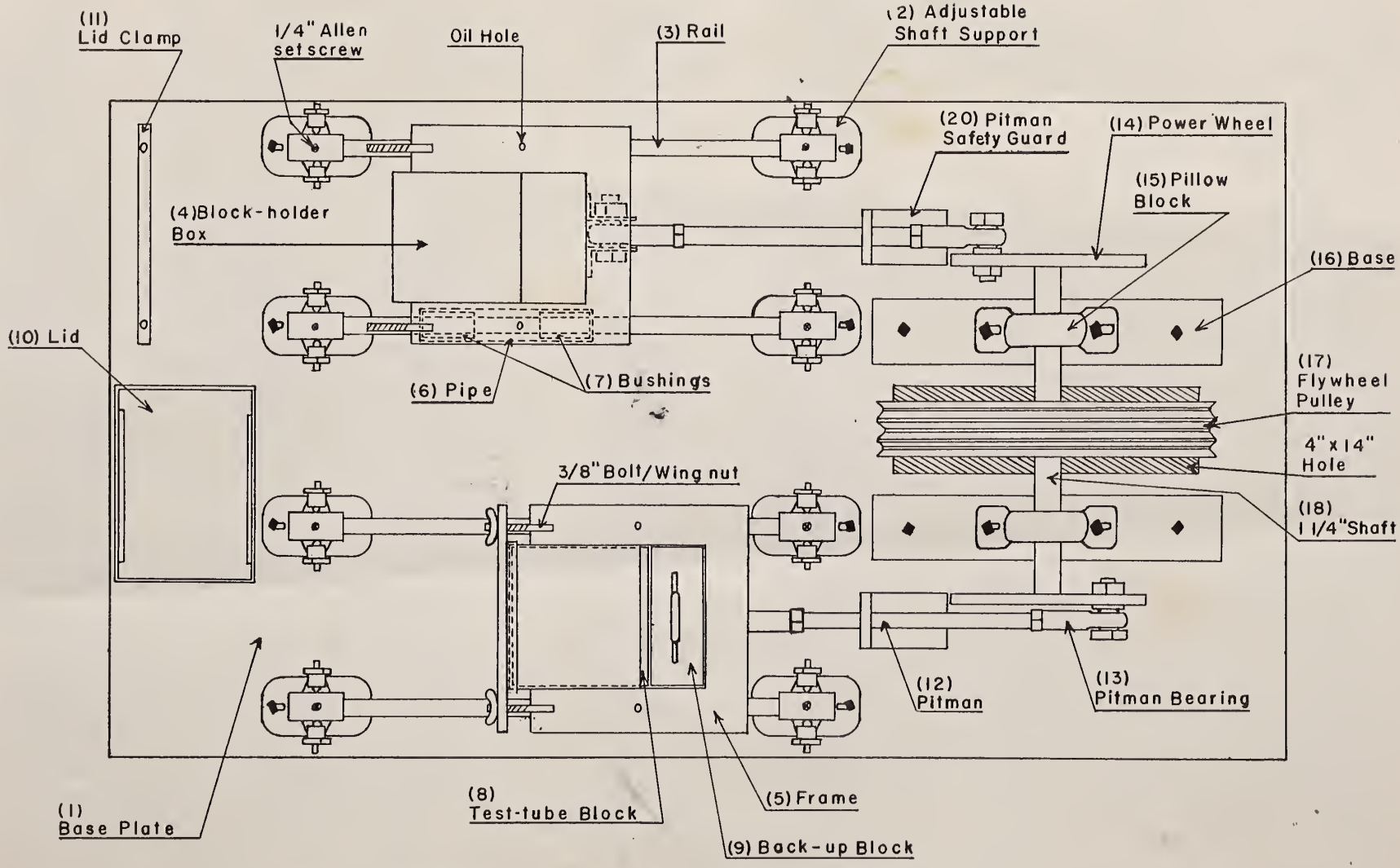
A 3-1/2-inch diameter (5/8-inch V-belt type) pulley was used on motor. The approximate speed of the flywheel is 390 r.p.m. (or strokes per minute).

Pitman safety guards (20)

Pitman safety guards were installed in front of adjustable shaft supports nearest power shaft. They were made from 5/16-inch plate 2-1/2 inches wide and 13 inches long. The plate was bent at a right angle, with 4 inches forming a base and the 9-inch erect portion formed the pitman guard by cutting a 1-1/8 by 4-1/2-inch slot through which the pitman operates freely.

Safety shield across open side of machine

A sheet of expanded metal, not shown, 12 inches high and 54 inches long should be fitted across open side of machine as a safety shield.



A Schematic diagram of the rice test-tube miller. (Top view)
Scale: inches 1 2 3 4